

**AGENDA BILL**

**Subject:** SR-520 Expansion Joint Noise Q&A

**Category:** ☐ Consent ☐ Ordinance ☐ Public Hearing  
☐ City Council Business ☐ Resolution ☒ Other – Discussion


**Prepared By:** Kellen Ruwe, Porter Foster Rorick LLP

**Summary:**

The attached Q&A is in preparation for Monday night's presentation from WSDOT. The attached provides background information and a list of questions that staff has regarding the noise and the expansion joint.

**Attachments:**

SR-520 Expansion Joint Noise Q&A

<b>Budget/Fiscal Impact:</b>	None
<b>Staff Recommendation:</b>	None. Discussion only.
<b>City Manager Approval:</b>	
<b>Proposed Council Motion:</b>	None.

CITY OF MEDINA | SR 520 EXPANSION JOINT NOISE Q&A

Since the completion of the new SR 520 floating bridge, citizens in the City of Medina and surrounding communities have experienced a new and annoying noise emanating from the bridge's expansion joints.

The problematic noise coming from these eastern joints is best described as an intermittent "thunk, thunk, thunk," generated by cars passing over the expansion joints at high speed. Medina residents have reported that this noise is audible at all hours but especially during off-peak traffic periods, including at night.

This Q&A offers information regarding state and federal laws pertaining to highway traffic noise, WSDOT's efforts to mitigate the expansion joint noise thus far, and what additional remedies might be explored.

**What laws govern highway noise?**

Highway noise is governed primarily by Federal Highway Administration (FHWA) regulations. Traffic noise impacts are defined as impacts which occur when the predicted traffic "noise levels approach or exceed the Noise Abatement Criteria (NAC)." For residential areas, the FHWA identifies 67 decibels (dBA) as the threshold at which transportation agencies must consider the feasibility of highway noise barriers or other mitigation measures. Per FHWA regulations, the energy-average sound levels from highways are measured to determine effects on residential areas. The hourly equivalent sound level (Leq) is the quantifier used by FHWA to evaluate predicted sound levels with respect to the Noise-Abatement Criterion. A measurement over a 15-minute interval is often sufficient to represent the hourly Leq and accurately characterize traffic noise in a given area.

The Washington State Department of Transportation (WSDOT) considers a predicted noise level of one dBA below the NAC as "approaching" the noise abatement threshold, and thus identifies 66 dBA as a potentially remediable noise impact. At this threshold, WSDOT assesses the feasibility of noise mitigation measures to achieve a "meaningful reduction in sound levels." Noise walls or barriers are typical abatement strategies that WSDOT uses to remedy highway noise impacts exceeding 66 dBA.

**Do federal or state law standards address noise "spikes," as opposed to average highway noise?**

No. The above described state and federal NAC structure does not account for isolated, irregular highway noises that are included in, but diluted by, an Leq measurement. Because the noise emanating from the expansion joints is an intermittent, sudden noise, it creates a uniquely annoying problem that is not fully reflected in a standard Leq measurement. Thus, insofar as the state and federal Noise Abatement Criteria are based on (energy-averaged) Leq measurements of permissible sound levels (dBA) in residential areas, they do not fully address—or potentially remedy—the expansion joint noise problem.

The federal government regulates transportation noise in other domains. With respect to aviation, the Federal Aviation Administration (FAA) uses an extreme average measurement—yearly day-night average sound level (YDNL)—to limit airport noise impacts on residential and other land use zones that are adjacent to airports. As with highway noise, this regulatory scheme requires feasible abatement where noise exceeds an identified average. However, the FAA regulations acknowledge that "any particular [YDNL] level may not... accurately assess an individual's perception of an actual noise environment," and

“adjustments or modifications of the descriptions of the land-use categories may be desirable after consideration of local conditions.” 14 CFR § A150.101(b).

Although these FAA regulations are not applicable to highway noise, they suggest that unique local conditions are at least relevant when considering Noise Abatement Criteria and a corresponding feasibility calculus. This information is helpful, since bridge expansion joint noise is not well researched and federal and state resources regarding its impacts and remedies are essentially nonexistent.

### **Did WSDOT consider expansion joint noise when designing the SR 520 bridge?**

Yes. Before construction on the new SR 520 got underway, the legislature created a Design Refinement and Transit Connections Workgroup. This group was tasked with recommending design refinements to WSDOT’s preliminary “preferred alternative” as identified in the Supplemental Draft Environmental Impact Statement (SDEIS) for the 520 project. This group considered feedback provided by an Expert Review Panel of professional acousticians and recommended the following noise management strategies:

- Continue to follow the required FHWA/WSDOT process for considering noise mitigation.
- Four-foot high traffic barriers with acoustically absorptive material from I-5 to the west approach of the floating bridge.
- Quieter concrete pavement along the SR 520 mainline the full length of the project, including the floating bridge.
- Acoustically absorptive materials around lid portals.
- Bridge expansion joint encapsulation to reduce noise transmission through bridge joints.
- Speed limit reduction on the Portage Bay Bridge.

Some of the Workgroup’s recommendations are reflected in the Final Environmental Impact Statement (FEIS) for the SR 520 project. The FEIS executive summary indicates that following expert recommended measures would be included in the final design:

- Four-foot traffic barriers with noise-absorptive coating;
- Noise absorptive materials at lid portals;
- Quieter concrete pavement; and
- Encapsulated bridge expansion joints.

The City intends to seek additional information from WSDOT to confirm that these measures were incorporated in the final bridge design and better understand how they are presently impacting the joint noise.

### **What additional construction or mitigation measures might further reduce the expansion joint noise?**

The City’s noise consultant has opined that mitigation efforts would best start with assessing the configuration of each expansion joint and exploring additional methods to provide smoother transitions over the noisiest expansion joints, possibly employing damping compounds applied to metal grates or resilient inserts in the gaps.

Strategically placed noise barriers coated in absorptive material, if not already present, could improve both the aggregate traffic noise coming from the bridge as well as the unique “thunk” coming from the

joints. In order to be effective, such barriers would have to extend from the bridge approach beyond the expansion joints, breaking the line of sight from residential receivers to the joints. This retrofit would represent a significant structural change impacting the aesthetic aspects of the bridge. The City does not yet have enough information about the structural design of the bridge to determine whether such a retrofit is structurally feasible or cost effective.

### **What questions have been asked of WSDOT?**

WSDOT is scheduled to attend the Medina City Council meeting on June 13, 2016. In order to better understand the expansion joint noise problem and potential remedies, the City has presented WSDOT with several questions in writing and asked that WSDOT representatives come prepared to address them, if possible.

- Has WSDOT's investigation accounted for the unique, intermittent/low frequency nature of the noise through methods other than traditional highway noise  $L_{eq}$ /dBA measurements?
- Has WSDOT taken  $L_{max}$  measurements that correspond to the 15-minute interval  $L_{eq}$  measurements reflected in its March 29, 2016 report? If so, what were those results?
- Has WSDOT evaluated the difference between  $L_{eq}$  and  $L_{max}$  measurements taken in the various locations described in its March 29, 2016 report?
- In what precise locations has WSDOT installed noise absorptive materials on the new bridge? Which of these installations were intended to remedy expansion joint noise, specifically?
- Is it possible to expand the joint encapsulation presently in place underneath the expansion joints?
- Does WSDOT have any data regarding the likely expansion joint noise output, absent the encapsulations?
- How does the difference between  $L_{max}$  and  $L_{eq}$  measurements taken near the 520 bridge differ from similar measurements taken in highway locations without expansion joints?
- Are additional noise walls that cross the line of sight around the expansion joints structurally feasible?
- Has WSDOT evaluated alternative and/or additional joint noise mitigation efforts at this time? If so, what specific methods is WSDOT considering?
- Which of the Design Refinement and Transit Connections Workgroup recommendations were actually constructed? What are the design specifications regarding the construction and/or implementation of each incorporated recommendation?

### **What happened with the expansion joint noise from the Tacoma Narrows Bridge?**

In 2011, WSDOT undertook efforts to mitigate noises emanating from the Tacoma Narrows bridge after nearby residents lodged complaints about an intermittent, low frequency noise caused by cars passing over the new bridge's expansion joints.

The Narrows did not qualify for noise abatement when analyzed pursuant to the FHWA and WSDOT Noise Abatement Criteria before construction. However, WSDOT responded to residents' post-construction complaints and piloted research to retrofit the bridge. These unique retrofit efforts were likely undertaken as a result of legislative interest and line-item funding.

WSDOT retrofitted the Narrows bridge with 10-foot tall concrete walls on either side, extending from the expansion joint back towards the bridge approach. These walls were coated in a sound absorptive panels made by a company called Soundsorb™. The crash barrier on both sides of the joint and the north and south side cable housings were also coated with these absorptive panels.

In order to measure the effectiveness of these coated sound walls, WSDOT took ten 15-minute time weighted-average  $L_{eq}$  measurements with a 1/3 octave band filter. This measurement tool captured individual frequency bands and measured the low-frequency “thunking” caused by the expansion joints. Post-retrofit measurements reflected a clear trend toward reduced low frequency sound. Local residents also reported that the “thunking” noise was less audible after the coated sound walls were built.

Importantly, prior to the Narrows retrofit, WSDOT had not undertaken any efforts to mitigate the expansion joint noise. The noise was entirely unanticipated, and the original Narrows bridge design did not incorporate any elements intended to reduce the noise. This fact is important in considering the effectiveness of the retrofit, and distinguishes the Narrows from SR 520 in a critical respect.